Roll No. .....

Total No. of Questions : **9**] [Total No. of Printed Pages : **4**

(2032)

UG (CBCS) IIIrd Year (Annual) Examination

3226

2022

B.Sc. PHYSICS

(Elements of Modern Physics)

(DSE-1A)

Paper : PHYS 301 TH

Time : 3 Hours] **[Maximum Marks : 50**

Note :– Attempt *five* questions in all, selecting *one* question from each Section–B, C, D and E. Question No. **1** (Section–A) is compulsory.

Section–A

(Compulsory Question)

2 each

1. (a) Why Compton Shift is not observed with visible light ?

(b) Why retarding potential applied to plate in Franck-Hertz Experiment ?

(c) What is an Operator ?

(d) Give *two* reasons that electron cannot exist inside the Nucleous.

(e) What is Internal Conversion ?

(f) What is relation between activity and half life of radioactive substance ?

(g) What are properties of a good moderator ?

Section–B

2. (a) Deduce relation between angle of scattering of a photon and direction of recoil electron in Compton scattering.

(b) A photon of wavelength 1.02 Å is scattered through 90° by free electron. Calculate change in wavelength of photon. 6.3

3. (a) Describe Franck-Hertz Experiment. How does this experiment shows discrete energy levels in an atom ?

(b) State and prove Bohr's correspondence principle. 6.3

Section–C

4. (a) What is Heisenberg's uncertainty principle ? Apply this principle to calculate minimum energy of harmonic oscillator.

   (b) Using uncertainty principle calculate energy of particle confined to region of space. 5,4

5. (a) Derive time independent Schrödinger equation.

   (b) Normalize the wave function given by :

$$\psi(x) = \begin{cases} A \sin \dfrac{\pi x}{a}, & \text{for } 0 \leq x < a \\ 0, & \text{outside} \end{cases}$$ 5,4

Section–D

6. What do you mean by particle in a box ? Determine energy levels and normalized wave functions for particle in a box. 9

7. (a) What is binding energy ? Explain variation of binding energy per nucleon with mass number (A).

   (b) What are magic numbers ? Give experimental evidence for their existance. 5,4

Section–E

8. (a) What are different modes of β-decay ? Under what conditions do they occur ?

   (b) Explain Geiger-Nuttal Law. Discuss its importance. 5,4

9. (a) What is a chain reaction ? What are factors on which escape of neutrons depends ?

   (b) Discuss construction and working of a nuclear reactor. 5,4